

IN THE CLAIMS

A clean version of the entire set of pending claims as amended by this Response is presented on the following page.

Claims 10, 22, 32, 45-58, 60, 62 and 64 are amended as indicated by a marked up version of the rewritten claims, which follows the Remarks, showing all changes relative to the previous version of the claims.

Clean Version of the Entire Set of Pending Claims

1 1. A DC to DC switching circuit for controlling power
2 switching devices in a DC to DC converter having first and second
3 interleaved converter circuits operating into a common load
4 comprising:

5 a current sense circuit sensing the voltage across a sense
6 resistor in series with the power supply supplying power to the
7 power switching devices;

8 a first pulse width modulator controlling the power
9 switching devices of the first converter circuit;

10 a second pulse width modulator controlling the power
11 switching devices of the second converter circuit;

12 a feedback circuit responsive to the voltage across the
13 common load;

14 control circuits for controlling the first and second pulse
15 width modulators responsive to the feedback circuit and a
16 commanded output voltage;

17 the control circuits also being responsive to the difference
18 in the voltage across the sense resistor when the first converter
19 is drawing power from the power supply through the sense resistor
20 and the second converter is not, and when the second converter is
21 drawing power from the power supply through the sense resistor
22 and the first converter is not, to adjust the relative duty cycle

23 of the first and second converters to tend to minimize the
24 difference in the voltage across the sense resistor;

25 the current sense circuit, the first pulse width modulator,
26 the second pulse width modulator, the feedback circuit and the
27 control circuits being in a single integrated circuit.

1 2. The DC to DC switching circuit of claim 1 wherein the ✓
2 sense resistor is external to the integrated circuit.

1 3. (Amended) The DC to DC switching circuit of claim 1
2 further comprised of an integrator having an output responsive to
3 the integral of an error signal, the error signal being
4 responsive to the voltage across the common load and a desired
5 voltage, the control circuits also being responsive to the output
6 of the integrator.

1 4. The DC to DC switching circuit of claim 3 wherein the
2 time constant of the integrator is adjustable by the selection of
3 at least one component external to the integrated circuit.

1 5. The DC to DC switching circuit of claim 3 further
2 comprised of a differentiator having an output responsive to the
3 rate of change of the voltage across the common load, the control
4 circuits also being responsive to the output of differentiator.

1 6. The DC to DC switching circuit of claim 5 wherein the
2 time constant of the differentiator is adjustable by the
3 selection of at least one component external to the integrated
4 circuit.

1 7. The DC to DC switching circuit of claim 1 wherein the
2 control circuits are also responsive to rapid decreases in the
3 voltage on the common load to turn on the first and second
4 converter circuits independent of the phase of the first and
5 second pulse width modulators.

1 8. The DC to DC switching circuit of claim 7 wherein the
2 control circuits are also responsive to rapid increases in the
3 voltage on the common load to turn off the first and second
4 converter circuits independent of the phase of the first and
5 second pulse width modulators.

1 9. The DC to DC switching circuit of claim 1 further
2 comprised of a load variation circuit coupled to the control
3 circuits to decrease the voltage on the common load for higher
4 voltages across the current sense resistor and to increase the
5 voltage on the common load for lower voltages across the current
6 sense resistor.

1 10. (Twice Amended) DC to DC switching circuit for
2 controlling power switching devices in a DC to DC converter
3 having first and second converter circuits operating into a
4 common load comprising:
5 a first pulse width modulator controlling the power
6 switching devices of the first converter circuit;
7 a second pulse width modulator controlling the power
8 switching devices of the second converter circuit;
9 a feedback circuit responsive to the voltage across the
10 common load;
11 control circuits for controlling the first and second pulse
12 width modulators responsive to the feedback circuit, the
13 operation of the first and second pulse width modulators being
14 interleaved;
15 the control circuits also being responsive to the difference
16 in currents through the first converter and the second converter
17 to adjust the relative duty cycle of the first and second
18 converters to tend to minimize the difference in the voltage
19 across a sense resistor;
20 the first pulse width modulator, the second pulse width
21 modulator, the feedback circuit and the control circuits being in
22 a single integrated circuit.

1 11. The DC to DC switching circuit of claim 10 wherein the
2 commanded output voltage is controllable through an input to the
3 integrated circuit.

1 12. The DC to DC switching circuit of claim 10 wherein the
2 commanded output voltage is controllable through a digital input
3 to the integrated circuit.

1 13. (Amended) The DC to DC switching circuit of claim 12
2 further comprised of an integrator having an output responsive to
3 the integral of an error signal, the error signal being
4 responsive to the voltage across the common load and a desired
5 voltage, the control circuits also being responsive to the output
6 of the integrator.

1 14. The DC to DC switching circuit of claim 13 wherein the
2 time constant of the integrator is adjustable by the selection of
3 at least one component external to the integrated circuit.

1 15. The DC to DC switching circuit of claim 13 further
2 comprised of a differentiator having an output responsive to the
3 rate of change of the voltage across the common load, the control
4 circuits also being responsive to the output of differentiator.

1 16. The DC to DC switching circuit of claim 15 wherein the
2 time constant of the differentiator is adjustable by the
3 selection of at least one component external to the integrated
4 circuit.

1 17. The DC to DC switching circuit of claim 12 wherein the
2 control circuits are also responsive to rapid decreases in the
3 voltage on the common load to turn on the first and second
4 converter circuits independent of the phase of the first and
5 second pulse width modulators.

1 18. The DC to DC switching circuit of claim 17 wherein the
2 control circuits are also responsive to rapid increases in the
3 voltage on the common load to turn off the first and second
4 converter circuits independent of the phase of the first and
5 second pulse width modulators.

1 19. The DC to DC switching circuit of claim 12 further
2 comprised of a load variation circuit coupled to the control
3 circuits to decrease the voltage on the common load for higher
4 currents through the converters and to increase the voltage on
5 the common load for lower currents through the converters.

1 20. The DC to DC switching circuit of claim 12 wherein the
2 commanded output voltage is controllable through an input to the
3 integrated circuit.

1 21. The DC to DC switching circuit of claim 12 wherein the
2 commanded output voltage is controllable through a digital input
3 to the integrated circuit.

1 22. (Three Times Amended) A DC to DC converter having a
2 plurality of converter circuits for operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators driven by a common
10 oscillator in an interleaved manner, each pulse width modulator
11 controlling one of the plurality of buck converter circuits,
12 whereby the operation of the buck converter circuits is
13 interleaved;

14 a feedback circuit responsive to a voltage across the common
15 load;

16 a voltage control circuit controlling the plurality of pulse
17 width modulators responsive to the feedback circuit and a
18 commanded output voltage; and

19 a current balance control circuit responsive to the
20 difference in currents in the plurality of interleaved buck
21 converter circuits and controlling the pulse width modulators to
22 balance the currents in the plurality of interleaved buck
23 converter circuits;

24 the plurality of pulse width modulators and the control
25 circuits being in a single integrated circuit.

1 24. (Twice Amended) The DC to DC converter of claim 22
2 further comprised of an integrator having an output responsive to
3 the integral of an error signal, the error signal being
4 responsive to the voltage across the common load and a desired
5 voltage, the control circuits also being responsive to the output
6 of the integrator.

1 25. (Amended) The DC to DC converter of claim 24 wherein a
2 time constant of the integrator is adjustable by the selection of
3 at least one component external to the integrated circuit.

1 26. (Amended) The DC to DC converter of claim 24 further
2 comprised of a differentiator having an output responsive to the

3 rate of change of the voltage across the common load, the control
4 circuits also being responsive to the output of differentiator.

1 27. (Amended) The DC to DC converter of claim 26 wherein
2 the time constant of the differentiator is adjustable by the
3 selection of at least one component external to the integrated
4 circuit.

1 28. (Amended) The DC to DC converter of claim 22 wherein
2 the control circuits are also responsive to rapid decreases in
3 the voltage across the common load to turn on the plurality of
4 buck converter circuits independent of the phase of the plurality
5 of pulse width modulators.

1 29. (Amended) The DC to DC converter of claim 28 wherein
2 the control circuits are also responsive to rapid increases in
3 the voltage across the common load to turn off the plurality of
4 buck converter circuits independent of the phase of the plurality
5 of pulse width modulators.

1 30. (Amended) The DC to DC converter of claim 22, wherein
2 the plurality of pulse width modulators consist of a pair of
3 pulse width modulators.

1 31. (Amended) The DC to DC converter of claim 22 wherein
2 the feedback circuit is in the single integrated circuit.

1 32. (Three Times Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators each controlling one
10 of the plurality of buck converter circuits, the operation of the
11 pulse width modulators and the buck converter circuits being
12 interleaved;

13 a feedback circuit responsive to a voltage across the common
14 load;

15 control circuits responsive to the feedback circuit and a
16 commanded output voltage to control a nominal duty cycle of the
17 plurality of buck converter circuits, the control circuits also
18 being responsive to the difference in currents in the plurality
19 of interleaved buck converter circuits to adjust relative duty
20 cycles of the plurality of buck converter circuits to balance the
21 currents in the buck converter circuits;

22 the plurality of pulse width modulators and the control
23 circuits being in a single integrated circuit.

1 34. (Twice Amended) The DC to DC converter of claim 32
2 wherein the control circuits control the plurality of pulse width
3 modulators.

1 35. (Amended) The DC to DC converter of claim 32 further
2 comprising an integrator having an output responsive to the
3 integral of an error signal, the error signal being responsive to
4 the voltage across the common load and a desired voltage.

1 36. (Twice Amended) The DC to DC converter of claim 35,
2 wherein the control circuits are also responsive to the output of
3 the integrator.

1 37. (Amended) The DC to DC converter of claim 35 wherein a
2 time constant of the integrator is adjustable by the selection of
3 at least one component external to the integrated circuit.

1 38. (Amended) The DC to DC converter of claim 35 further
2 comprising a differentiator having an output responsive to a rate
3 of change of the voltage across the common load, the control
4 circuits also being responsive to the output of differentiator.

1 39. (Amended) The DC to DC converter of claim 38 wherein a
2 time constant of the differentiator is adjustable by the

3 selection of at least one component external to the integrated
4 circuit.

1 40. (Amended) The DC to DC converter of claim 32 wherein
2 the control circuits are also responsive to rapid decreases in
3 the voltage across the common load to turn on the plurality of
4 buck converter circuits, independent of the phase of the
5 plurality of pulse width modulators.

1 41. (Amended) The DC to DC converter of claim 32 wherein
2 the control circuits are also responsive to rapid increases in
3 the voltage across the common load to turn off the plurality of
4 buck converter circuits, independent of the phase of the
5 plurality of pulse width modulators.

1 42. (Amended) The DC to DC converter of claim 32, wherein
2 the plurality of pulse width modulators consist of a pair of
3 pulse width modulators.

1 43. (Amended) The DC to DC converter of claim 32 wherein
2 the commanded output voltage is controllable through an input to
3 the integrated circuit.

1 44. (Amended) The DC to DC converter of claim 32 wherein
2 the feedback circuit is in the single integrated circuit.

1 45. (Three Times Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators each controlling one
10 of the plurality of buck converter circuits, the operation of the
11 pulse width modulators being interleaved;

12 control circuits for adjusting a nominal duty cycle of the
13 plurality of interleaved buck converter circuits, the control
14 circuits also being responsive to the difference in currents in
15 the plurality of interleaved buck converter circuits to adjust
16 the relative duty cycles of the plurality of buck converter
17 circuits to balance the currents therein;

18 the plurality of pulse width modulators and the control
19 circuits being in a single integrated circuit.

1 46. (Twice Amended) A DC to DC converter having first and
2 second converter circuits operating into a common load,
3 comprising:

4 first and second buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a first pulse width modulator controlling the first buck
10 converter circuit;

11 a second pulse width modulator controlling the second buck
12 converter circuit;

13 a feedback circuit responsive to the voltage across the
14 common load;

15 control circuits for controlling the first and second pulse
16 width modulators responsive to the feedback circuit;

17 the control circuits also being responsive to current
18 measurements in the first buck converter circuit and the second
19 buck converter circuit for adjusting the relative duty cycle of
20 the first and second pulse width modulators to balance the
21 currents in the buck converter circuits;

22 the first pulse width modulator, the second pulse width
23 modulator, the feedback circuit and the control circuits being in
24 a single integrated circuit.

1 47. (Twice Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators driven by a common
10 oscillator in an interleaved manner, each pulse width modulator
11 controlling one of the plurality of buck converter circuits,
12 whereby the operation of the buck converter circuits is
13 interleaved;

14 a feedback circuit responsive to a voltage across the common
15 load;

16 a voltage control circuit for controlling the plurality of
17 pulse width modulators responsive to the feedback circuit and a
18 commanded output voltage; and

19 a current balance control circuit responsive to the
20 difference in currents in the plurality of interleaved buck
21 converter circuits for controlling the pulse width modulators to
22 balance the currents in the plurality of interleaved buck
23 converter circuits;

24 the plurality of pulse width modulators, the feedback
25 circuit, the voltage control circuit and the current balance
26 control circuit being in a single integrated circuit.

1 48. (Twice Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators each controlling power
10 switching devices of one of the plurality of interleaved buck
11 converter circuits, the operation of the pulse width modulators
12 and the buck converter circuits being interleaved;

13 a feedback circuit responsive to a voltage across the common
14 load;

15 control circuits responsive to the feedback circuit and a
16 commanded output voltage to control a nominal duty cycle of the
17 plurality of buck converter circuits, the control circuits also
18 being responsive to the difference in currents in the plurality
19 of interleaved buck converter circuits to adjust the relative
20 duty cycles of the plurality of buck converter circuits to
21 balance the currents in the buck converter circuits;

22 the plurality of pulse width modulators, the feedback
23 circuit and the control circuits being in a single integrated
24 circuit.

1 49. (Twice Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators each controlling one
10 of the plurality of buck converter circuits, the pulse width
11 modulators being driven by a common oscillator signal so that the
12 operation of the pulse width modulators is interleaved;

13 control circuits for adjusting a nominal duty cycle of the
14 plurality of interleaved buck converter circuits to control a
15 voltage on the common load, and for responding to the difference
16 in currents in the plurality of interleaved buck converter
17 circuits to adjust the relative duty cycles of the plurality of
18 buck converter circuits to balance the currents in the buck
19 converter circuits;

20 the plurality of pulse width modulators and the control
21 circuits being in a single integrated circuit.

1 50. (Twice Amended) A DC to DC converter having first and
2 second converter circuits operating into a common load,
3 comprising:

4 first and second buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a first pulse width modulator controlling the first buck
10 converter circuit;

11 a second pulse width modulator controlling the second buck
12 converter circuit;

13 a feedback circuit responsive to the voltage across the
14 common load;

15 control circuits for controlling the first and second pulse
16 width modulators responsive to the feedback circuit;

17 the control circuits also being responsive to current
18 measurements through the first buck converter circuit and the
19 second buck converter circuit to adjust the relative duty cycle
20 of the first and second buck converter circuits

21 the first pulse width modulator, the second pulse width
22 modulator and the control circuits being in a single integrated
23 circuit.

1 51. (Twice Amended) A DC to DC converter comprising:

2 a plurality of buck converter circuits operating into the
3 common load, each buck converter circuit having an inductor for
4 alternately conducting between the first power supply terminal
5 and the common load, and the second power supply terminal and the
6 common load;

7 a plurality of pulse width modulators driven by a common
8 oscillator in an interleaved manner, each pulse width modulator
9 controlling one of the plurality of buck converter circuits,
10 whereby the operation of the buck converter circuits is
11 interleaved;

12 a feedback circuit responsive to a voltage on the common
13 output;

14 a voltage control circuit for controlling the plurality of
15 pulse width modulators responsive to the feedback circuit and a
16 commanded output voltage; and

17 a current balance control circuit for controlling the pulse
18 width modulators responsive to a difference in currents in the
19 inductors of the plurality of interleaved buck converter circuits
20 to balance the currents in the plurality of interleaved buck
21 converter circuits;

22 the plurality of pulse width modulators and the control
23 circuits being in a single integrated circuit.

1 52. (Twice Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators each controlling power
10 switching devices of one of the plurality of buck converter
11 circuits, the operation of the pulse width modulators and the
12 buck converter circuits being interleaved;

13 a feedback circuit responsive to a voltage across the common
14 load;

15 control circuits being responsive to the feedback circuit
16 and a commanded output voltage to control a nominal duty cycle of
17 the plurality of buck converter circuits, the control circuits
18 also being responsive to the difference in currents in the
19 plurality of interleaved buck converter circuits to adjust the
20 relative duty cycles of the plurality of buck converter circuits
21 to balance the currents in the buck converter circuits;

22 the plurality of pulse width modulators and the control
23 circuits being in a single integrated circuit.

1 53. (Twice Amended) A DC to DC converter having first and
2 second converter circuits operating into a common load,
3 comprising:

4 first and second buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a first pulse width modulator controlling the first buck
10 converter circuit;

11 a second pulse width modulator controlling the second buck
12 converter circuit;

13 a feedback circuit responsive to the voltage across the
14 common load;

15 control circuits for controlling the first and second pulse
16 width modulators responsive to the feedback circuit;

17 the control circuits also being responsive to current
18 measurements in the first buck converter circuit and the second
19 buck converter circuit to adjust the relative duty cycle of the
20 first and second buck converter circuits;

21 the first pulse width modulator, the second pulse width
22 modulator, the feedback circuit and the control circuits being in
23 a single integrated circuit.

1 54. (Twice Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators driven by a common
10 oscillator in an interleaved manner, each pulse width modulator
11 controlling one of the plurality of buck converter circuits,
12 whereby the operation of the buck converter circuits is
13 interleaved;

14 a feedback circuit responsive to a voltage across the common
15 load;

16 a voltage control circuit for controlling the plurality of
17 pulse width modulators responsive to the feedback circuit and a
18 commanded output voltage; and

19 a current balance control circuit for controlling the pulse
20 width modulators to balance the currents in the plurality of
21 interleaved buck converter circuits responsive to the difference
22 in currents in the plurality of interleaved buck converter
23 circuits;

24 the plurality of pulse width modulators, the voltage control
25 circuit and the current balance control circuit being in a single
26 integrated circuit.

1 55. (Twice Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:
4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;
9 a plurality of pulse width modulators each controlling power
10 switching devices of one of the plurality of interleaved buck
11 converter circuits, the operation of the pulse width modulators
12 and the buck converter circuits being interleaved;
13 a feedback circuit responsive to a voltage across the common
14 load;
15 control circuits responsive to the feedback circuit and a
16 commanded output voltage to control a nominal duty cycle of the
17 plurality of buck converter circuits, the control circuits also
18 adjusting relative duty cycles of the plurality of buck converter
19 circuits to balance the currents in the buck converter circuits
20 responsive to the difference in currents in the plurality of
21 interleaved buck converter circuits;

22 the plurality of pulse width modulators and the control
23 circuits being in a single integrated circuit.

1 56. (Twice Amended) A DC to DC converter having a
2 plurality of converter circuits operating into a common load,
3 comprising:

4 a plurality of buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a plurality of pulse width modulators each controlling one
10 of the plurality of buck converter circuits, the pulse width
11 modulators being driven by a common oscillator signal so that the
12 operation of the pulse width modulators is interleaved;

13 control circuits for adjusting a nominal duty cycle of the
14 plurality of interleaved buck converter circuits to control a
15 voltage on the common load, and for adjusting relative duty
16 cycles of the plurality of buck converter circuits to balance the
17 currents in the buck converter circuits;

18 the plurality of pulse width modulators and the control
19 circuits being in a single integrated circuit.

1 57. (Twice Amended) A DC to DC converter having first and
2 second buck converter circuits operating into a common load,
3 comprising:

4 first and second buck converter circuits operating into the
5 common load, each buck converter circuit having an inductor for
6 alternately conducting between the first power supply terminal
7 and the common load, and the second power supply terminal and the
8 common load;

9 a first pulse width modulator controlling the first buck
10 converter circuit;

11 a second pulse width modulator controlling the second buck
12 converter circuit;

13 a feedback circuit responsive to the voltage across the
14 common load;

15 control circuits for controlling the first and second pulse
16 width modulators responsive to the feedback circuit;

17 the control circuits also being responsive to current
18 measurements in the first buck converter circuit and the second
19 buck converter circuit to adjust the relative duty cycle of the
20 first and second pulse width modulators to balance the currents
21 in the buck converter circuits;

22 the first pulse width modulator, the second pulse width
23 modulator and the control circuits being in a single integrated
24 circuit.

1 58. (Amended) A DC to DC converter having a plurality of
2 converter circuits for operating into a common load, comprising:

3 a plurality of buck converter circuits operating into the
4 common load, each buck converter circuit having an inductor for
5 alternately conducting between the first power supply terminal
6 and the common load, and the second power supply terminal and the
7 common load;

8 a plurality of pulse width modulators driven by a common
9 oscillator in an interleaved manner, each pulse width modulator
10 controlling one of the plurality of buck converter circuits,
11 whereby the operation of the buck converter circuits is
12 interleaved;

13 a feedback circuit responsive to a voltage across the common
14 output;

15 a voltage control circuit controlling the plurality of pulse
16 width modulators responsive to the feedback circuit and a
17 commanded output voltage;

18 the plurality of pulse width modulators and the control
19 circuits being in a single integrated circuit.

1 59. The DC to DC converter of claim 58 further comprising
2 the common oscillator, the common oscillator also being in the
3 single integrated circuit.

1 60. (Amended) A DC to DC converter having a plurality of
2 converter circuits operating into a common load, comprising:

3 a plurality of buck converter circuits operating into the
4 common load, each buck converter circuit having an inductor for
5 alternately conducting between the first power supply terminal
6 and the common load, and the second power supply terminal and the
7 common load;

8 a plurality of pulse width modulators each controlling one
9 of the plurality of buck converter circuits, the operation of the
10 pulse width modulators and the buck converter circuits being
11 interleaved;

12 a feedback circuit responsive to a voltage across the common
13 load;

14 control circuits responsive to the feedback circuit and a
15 commanded output voltage to control a nominal duty cycle of the
16 plurality of buck converter circuits;

17 the plurality of pulse width modulators and the control
18 circuits being in a single integrated circuit.

1 61. The DC to DC converter of claim 60 further comprising
2 the common oscillator, the common oscillator also being in the
3 single integrated circuit.

1 62. (Amended) A DC to DC converter comprising:

2 first and second buck converter circuits operating into a
3 common load, each buck converter circuit having an inductor for
4 alternately conducting between the first power supply terminal
5 and the common load, and the second power supply terminal and the
6 common load;

7 first and second pulse width modulators driven by a common
8 oscillator in an interleaved manner, each pulse width modulator
9 controlling a respective one of the first and second buck
10 converter circuits, whereby the operation of the buck converter
11 circuits is interleaved;

12 a feedback circuit responsive to a voltage across the common
13 output;

14 a voltage control circuit controlling the first and second
15 pulse width modulators responsive to the feedback circuit and a
16 commanded output voltage;

17 the plurality of pulse width modulators and the control
18 circuits being in a single integrated circuit.

1 63. The DC to DC converter of claim 62 further comprising
2 the common oscillator, the common oscillator also being in the
3 single integrated circuit.

1 64. (Amended) A DC to DC converter comprising:

2 first and second buck converter circuits operating into a
3 common load, each buck converter circuit having an inductor for
4 alternately conducting between the first power supply terminal
5 and the common load, and the second power supply terminal and the
6 common load;

7 first and second pulse width modulators each controlling a
8 respective one of the buck converter circuits, the operation of
9 the pulse width modulators and the buck converter circuits being
10 interleaved;

11 a feedback circuit responsive to a voltage across the common
12 load;

13 control circuits responsive to the feedback circuit and a
14 commanded output voltage to control a nominal duty cycle of the
15 plurality of buck converter circuits;

16 the plurality of pulse width modulators and the control
17 circuits being in a single integrated circuit.

1 65. The DC to DC converter of claim 64 further comprising
2 the common oscillator, the common oscillator also being in the
3 single integrated circuit.